

IN THE CLAIMS

Please cancel claims 54, 71 and 75 without prejudice or disclaimer, amend claims 12, 17, 21, 36, 39 thru 41, 48 thru 53, 55 thru 70, 72 thru 74 and 76 thru 78, and add claim 79, as follows:

Claims 1 through 6. (Canceled)

1 7. (Previously Presented) A cathode for an electron tube, comprising:
2 a metal base; and
3 an electron-emitting material layer coated on the metal base, said electron-emitting
4 material layer comprising a needle-shaped conductive material;
5 said needle-shaped conductive material being at least one material selected from a
6 group consisting essentially of carbon, indium tin oxide, nickel, magnesium, rhenium,
7 molybdenum and platinum;
8 said needle-shaped conductive material being a carbonaceous material, said needle-
9 shaped conductive material being in a range of 0.01 to 30% by weight based on a total weight
10 of said electron-emitting material layer, and a thickness of said electron-emitting material
11 layer being in a range of 30 to 80 μm .

Claims 8 and 9. (Canceled)

1 10. (Previously Presented) A cathode for an electron tube, comprising:
2 a metal base; and
3 an electron-emitting material layer coated on the metal base, said electron-emitting
4 material layer comprising a needle-shaped conductive material and having a surface
5 roughness corresponding to a distance between a highest point and a lowest point on a
6 surface of the electron-emitting material layer being less than 10 microns.

Claim 11. (Canceled)

1 12. (Currently Amended) ~~[[The]] A cathode of claim 10, for an electron tube,~~
2 comprising:
3 a metal base; and
4 an electron-emitting material layer coated on the metal base, said electron-emitting
5 material layer comprising a needle-shaped conductive material;
6 said needle-shaped conductive material being at least one material selected from
7 [[the]] a group consisting essentially of indium tin oxide, nickel, magnesium, rhenium,
8 molybdenum and platinum.

Claims 13 through 15. (Canceled)

1 16. (Previously Presented) The cathode of claim 10, said needle-shaped conductive

material in the electron-emitting material layer being in a range of 0.01 to 30% by weight based on a total weight of said electron-emitting material.

17. (Currently Amended) [[The]] A cathode for an electron tube, comprising:
a metal base; and
an electron-emitting material layer coated on the metal base, said electron-emitting material layer comprising a needle-shaped conductive material of claim 10, said needle-shaped conductive material being a carbonaceous material, said needle-shaped conductive material being in a range of 0.01 to 30% by weight based on a total weight of said electron-emitting material layer, and a thickness of said electron-emitting material layer being in a range of 30 to 80 μ m.

Claims 18 and 19. (Canceled)

20. (Previously Presented) The cathode of claim 10, further comprising a metal layer including nickel grains having sizes smaller than sizes of grains in said metal base, said metal layer being formed between said metal base and said electron-emitting material layer.

21. (Currently Amended) The cathode of claim 20, said metal layer further including at least one metal selected from [[the]] a group consisting essentially of aluminum (Al), tungsten (W), tantalum (Ta), chromium (Cr), magnesium (Mg), silicon (Si) and zirconium

4 (Zr).

1 22. (Previously Presented) The cathode of claim 10, further comprising a metal layer
2 formed between said metal base and said electron-emitting material layer, a thickness of said
3 metal layer being in a range of 1 to 30 μm .

Claims 23 through 28. (Canceled)

1 29. (Previously Presented) An oxide cathode for an electron tube, comprising:
2 a metal base; and
3 an electron-emitting material layer coated on the metal base, said electron-emitting
4 material layer comprising a needle-shaped conductive material;
5 said needle-shaped conductive material being at least one material selected from a
6 group consisting essentially of carbon, indium tin oxide, nickel, magnesium, rhenium,
7 molybdenum and platinum;
8 said needle-shaped conductive material being a carbonaceous material, said needle-
9 shaped conductive material being in a range of 0.01 to 30% by weight based on a total weight
10 of said electron-emitting material layer, and a thickness of said electron-emitting material
11 layer being in a range of 30 to 80 μm .

Claims 30 through 35. (Canceled)

1 36. (Currently Amended) The method of claim [[75]] 78, wherein the coating step
2 includes applying pressure on a coating layer in order to attain a desired level of surface
3 roughness.

1 37. (Previously Presented) The method of claim 36, wherein the step of applying the
2 pressure on the coating layer comprises at least one of printing, electrodeposition and
3 painting.

1 38. (Previously Presented) The method of claim 37, wherein the printing includes at
2 least one of screen printing and roll coating.

1 39. (Currently Amended) The method of claim [[75]] 78, wherein the coating step
2 comprises coating to a thickness in a range of 30 to 80 microns so as to obtain good electron
3 emission characteristics.

1 40. (Currently Amended) The method of claim [[75]] 78, said needle-shaped
2 conductive material in the electron-emitting ~~material~~ layer being in a range of 0.01 to 30%
3 by weight based on a total weight of [[said]] electron-emitting material.

1 41. (Currently Amended) The method of claim [[75]] 78, further comprising the step,
2 between the providing step and the coating step, of forming a metal layer on the metal base.

1 42. (Previously Presented) The method of claim 41, wherein the metal layer
2 comprises nickel and a refractory metal to reinforce mechanical strength of the cathode.

1 43. (Previously Presented) The method of claim 41, further comprising the step, prior
2 to forming the metal layer on the metal base, of mixing nickel powder and at least one of
3 tungsten and aluminum as a reducing agent to prepare a metal layer material.

1 44. (Previously Presented) The method of claim 43, further comprising the step, after
2 the mixing step, of homogeneously mixing the metal layer material with an organic binder
3 and a liquid-phase organic solvent to prepare a paste which, when deposited on the metal
4 base, forms the metal layer on the metal base.

1 45. (Previously Presented) The method of claim 41, wherein the forming step
2 comprises applying metal layer material to the metal base, and then thermally treating the
3 applied metal layer material in one of a vacuum and an inert gas atmosphere to obtain the
4 metal layer without organic matter.

1 46. (Previously Presented) The method of claim 41, wherein the forming step
2 comprises one of printing, spraying, electrodeposition and painting.

1 47. (Previously Presented) A cathode prepared by the method of claim [[75]] 78.

1 48. (Currently Amended) A cathode, comprising:

2 a metal base;

3 layer means disposed upon said metal base[[,]] for emitting electrons; and

4 additional means ~~exhibiting~~ for providing electrically conducting paths through said
5 layer means for emitting electrons, said additional means comprising a needle-shaped
6 electrically conductive material ~~exhibiting~~ having a specific resistance not greater than 10^{-1}
7 ohms centimeter, and comprising 0.01% by weight to 30% by weight of said layer means, ~~for~~
8 ~~providing electrically conducting paths through said means for emitting electrons.~~

1 49. (Currently Amended) The cathode of claim 48, further comprising a metal layer
2 exhibiting a grain size smaller than said metal base and interposed between said metal base
3 and said layer means.

1 50. (Currently Amended) The cathode of claim 48, ~~comprising~~ said needle-shaped
2 conductive material being selected from a group consisting essentially of carbon, indium tin
3 oxide, nickel, magnesium, rhenium, molybdenum and platinum.

1 51. (Currently Amended) A cathode, comprising:

2 a metal base;
3 a layer of [[an]] electron-emitting material disposed upon said base; and
4 a needle-shaped electrically conductive material providing electrically conductive
5 paths disposed throughout said layer of electron-emitting material;
6 said needle-shaped electrically conductive material having a specific resistance not
7 greater than 10^{-1} ohms centimeter.

1 52. (Currently Amended) The cathode of claim 51, further comprising a metal layer
2 exhibiting a grain size smaller than said metal base and interposed between said metal base
3 and said layer of electron-emitting material.

1 53. (Currently Amended) The cathode of claim 51, [[with]] said conductive material
2 comprising 0.01% by weight to 30% by weight of said layer of electron-emitting material.

Claim 54. (Canceled)

1 55. (Currently Amended) The cathode of claim 51, ~~comprised of~~ said layer ~~exhibiting~~
2 of electron-emitting material having a surface roughness corresponding to a distance
3 between a highest point and a lowest point on a surface of the electron-emitting material
4 being less than 10 microns.

1 56. (Currently Amended) ~~[[The]]~~ A cathode, of claim 51, with comprising:
2 a metal base;
3 a layer of electron-emitting material disposed upon said base; and
4 a needle-shaped electrically conductive material providing electrically conductive
5 paths disposed throughout said layer of electron-emitting material;
6 said ~~metal base comprising~~ layer of electron-emitting material having a thickness in
7 a range of 30 microns to 80 microns.

1 57. (Currently Amended) A cathode, comprising:
2 a metal base; and
3 a layer disposed upon said metal base~~[[,]]~~;
4 said layer ~~comprised of:~~ comprising an electron-emitting material, and a needle-
5 shaped electrically conductive material ~~exhibiting~~ disposed within said layer and having a
6 specific resistance less than a specific resistance of said electron-emitting material;~~disposed~~
7 ~~within said layer.~~

1 58. (Currently Amended) The cathode of claim 57, ~~comprised of~~ said needle-shaped
2 electrically conductive material providing electrically conductive paths in said layer ~~of~~
3 ~~electron-emitting material.~~

1 59. (Currently Amended) The cathode of claim 57, ~~comprised of~~ said layer ~~exhibiting~~

2 having a surface roughness corresponding to a distance between a highest point and a lowest
3 point on a surface of the electron-emitting material being less than 10 microns.

1 60. (Currently Amended) The cathode of claim 57, ~~[[with]]~~ said conductive material
2 ~~comprising~~ having a specific resistance not greater than 10^{-1} ohms centimeter.

1 61. (Currently Amended) The cathode of claim 57, ~~comprised of~~ said layer having a
2 thickness in a range of 30 microns to 80 microns.

1 62. (Currently Amended) The cathode of claim 57, ~~[[with]]~~ said conductive material
2 comprising 0.01% by weight to 30% by weight of said layer.

1 63. (Currently Amended) A cathode, comprising:
2 a metal base; and
3 a layer disposed upon said base~~[[,]]~~;
4 said layer ~~comprised of~~ comprising an electron-emitting material, and a needle-
5 shaped electrically conductive material ~~exhibiting~~ having a specific resistance not greater
6 than 10^{-1} ohms centimeter.

1 64. (Currently Amended) The cathode of claim 63, further comprising a metal layer
2 ~~exhibiting~~ having a grain size smaller than a grain size of said metal base, and interposed

between said metal base and said layer.

65. (Currently Amended) The cathode of claim 63, ~~[[with]]~~ said conductive material comprising 0.01% by weight to 30% by weight of said layer.

66. (Currently Amended) The cathode of claim 63, ~~comprised of~~ said layer ~~exhibiting~~ having a surface roughness corresponding to a distance between a highest point and a lowest point on a surface of the electron-emitting material being less than 10 microns.

67. (Currently Amended) The cathode of claim 63, ~~[[with]]~~ said ~~metal base~~ comprising layer of electron-emitting material having a thickness in a range of 30 microns to 80 microns.

68. (Currently Amended) A cathode, comprising:
a metal base;
a layer of electron-emitting material including an electron-emitting barium-based alkali-earth metal carbonate material disposed upon said base; and
a needle-shaped electrically conductive material providing electrically conductive paths in said layer of electron-emitting material;
said conductive material having a specific resistance not greater than 10^{-1} ohms centimeter.

1 69. (Currently Amended) The cathode of claim 68, further comprising a metal layer
2 ~~exhibiting~~ having a grain size smaller than a grain size of said metal base, and interposed
3 between said metal base and said layer of electron-emitting material.

1 70. (Currently Amended) The cathode of claim 68, ~~[[with]]~~ said conductive material
2 comprising 0.01% by weight to 30% by weight of said metal layer.

Claim 71. (Canceled)

1 72. (Currently Amended) A cathode, comprising:
2 a metal base; and
3 a layer formed on said base~~[[,]]~~ from a carbonate paste ~~comprised of~~ comprising a
4 barium-based carbonate electron-emitter and a needle-shaped electrically conductive
5 powder;
6 said needle-shaped electrically conductive powder having a specific resistance not
7 greater than 10^{-1} ohms centimeter.

1 73. (Currently Amended) The cathode of claim 72, further comprising a metal layer
2 ~~exhibiting~~ having a grain size smaller than a grain size of said metal base and interposed
3 between said metal base and said layer.

1 74. (Currently Amended) The cathode of claim 72, ~~[[with]]~~ said needle-shaped
2 electrically conductive powder comprising 0.01% by weight to 30% by weight of said layer.

Claim 75. (Canceled)

1 76. (Currently Amended) The cathode of claim 72, ~~comprised of~~ said layer ~~exhibiting~~
2 having a surface roughness corresponding to a distance between a highest point and a lowest
3 point on a surface of the ~~electron-emitting material~~ layer being less than 10 microns.

1 77. (Currently Amended) ~~[[The]]~~ A cathode, of claim 72, with comprising:
2 a metal base; and
3 a layer formed on said base from a carbonate paste comprising a barium-based
4 carbonate electron-emitter and a needle-shaped electrically conductive powder;
5 ~~said metal base comprising~~ layer having a thickness in a range of 30 microns to 80
6 microns.

1 78. (Currently Amended) A method of preparing a cathode for an electron tube,
2 comprising the steps of:
3 providing a metal base;
4 depositing on said metal base a carbonate paste comprising a barium-based carbonate

5 electron emitter and a needle-shaped conductive material; and

6 coating the carbonate paste containing the needle-shaped conductive material onto
7 the metal base, and then drying to form an electron-emitting layer of the cathode.

1 79. (New) The cathode of claim 17, said electron-emitting material layer having a
2 surface roughness corresponding to a distance between a highest point and a lowest point on
3 a surface of said electron-emitting material layer being less than 10 microns.